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Using Collective Adaptive Networks to Solve Education Problems in Poor Countries

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Using Collective Adaptive Networks to Solve Education Problems in Poor Countries

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Abstract: Can education problems in poor countries be successfully addressed using knowledge economics? The old development model posits that poor countries must follow the route of richer countries, progressing up a scale of development. But an emerging theory of development and collective adaptive applications applied to new learning theory suggests new possibilities. This paper outlines a pilot project underway in Zambia. The idea is based on a global network, which supports collective adaptive knowledge construction and local learning, representing a substantial deviation from standard foreign aid. Using the small pilot school in Zambia local knowledge is gathered and combined with global knowledge, to generate content that has, heretofore, been unavailable on the Web. This approach is fundamentally different from e-learning, which delivered lectures from afar. It builds a knowledge base that is relevant to poor countries, enabling them to advance their local economy.

Keywords: Knowledge Economics, Development Aid, Learning Concept, African Pilot Project, Locally Relevant Education, Community Knowledge.

JEL Classification Numbers: A31, C80, D02, D83, I21, I23, Q01, R58.

1. Introduction

Education in most African countries grew out of a colonial model. Two continuing problems pervade higher education because of this legacy. First, there is no precedence for linking higher education to local problems. Second, although donor agencies have partially funded primary and secondary educational systems, higher education is mostly under-resourced. Fifty years after much of Africa reached independence; higher education continues to be of such poor quality that only graduates capable of making a contribution to their countries have generally left the country to be educated elsewhere and remain in Europe or the United States, where they can earn more money. Consequently, the knowledge flow continues to be one way – rarely is Africa a source of knowledge, even for its own development purposes.

The goal of this paper is to outline an alternative approach to higher education that is under development as a joint project between Seoul National University in Korea and Zambia. The project derives from several emerging theories in development, economics, and learning, as well as the use of IT.

This paper discusses the failure of the existing development approaches, introduces the framework of our approach, and describes its application within a pilot project in Zambia.

2. The Failure of Development

The development approach used in poor countries today comes from a model born from the aftermath of World War II (Arndt, 1987). There was one clear goal – attain the development levels of the wealthier countries by following the known path of development (Rostow, 1960). The development model assumed that there was one clear path to development – that followed by wealthier countries, the clear expertise lay with those who had the knowledge of this path. All viable knowledge, relative to development, lay within the wealthier countries.

Consequently, education became embedded in four assumptions. First, the higher one progressed in the educational ladder, the more one learned about how the wealthier, more knowledgeable countries and societies worked. Second, knowledge lay embedded in wealthier countries and societies. Third, solutions to problems can be solved by bringing in expertise from wealthier countries. Fourth, an educated local person was one, who had mastered the knowledge from wealthier countries.

The notion that all countries can simply follow the development path of wealthier countries assumed that economic growth can be achieved by being part of the global economic system and the global educational system. However, within poor countries the beneficiaries of this system are a small number of people working for multi-national corporations and foreign aid organizations. The majority of the people do not benefit at all. Instead of addressing this shortcoming directly, development programs address the symptoms. They bring technology to local communities to solve problems problems as perceived by foreign experts. In many cases, these technological solutions fail as soon as the development projects stops and the foreign experts leave the country (Riddell, 2007; Griffin, 1991). The reasons are that either the technical expertise is missing in the local communities, the spare parts are not available to these communities, or that the

problem was wrongly conceived in the first place. It demonstrates that local issues (i.e., knowledge) are not considered in the design of these solutions.

3. Framework for a New Approach

3.1. Knowledge Economics

The problems inherent in the prevailing development approach, its concomitant welfare theory and human capital theories and the handling of knowledge in a networked global world, are handled much better using knowledge economics (Romer, 1993). Rather than to view education as merely an input to industrial productivity, education could be thought of as a means of building a resource from which new ideas, creativity and innovation could spring. People might well become more productive through higher education but it is also their ability to create new possibilities and ideas that actually move their societies forward in large ways (Lundvall & Johnson, 1994). The theory of knowledge economics provides a framework for understanding the world as a networked system, whereby resources and people are co-dependent and financial, social, communication, physical, and knowledge resources are shared.

3.2. A Shift in Learning Objectives

The challenge now is to rethink education in the digital age, using the new thinking of development and knowledge economics. Two major shifts are ushering in a major shift in the approach of learning. First, the learning environment is changing. Second, the problems that we are facing in a globally linked economy become increasingly complex.

The field of education is just beginning to understand how to take advantage of this new digital environment and the new value networks (Ahmed, 2010; Darmofal, 2002; Hanford, 2012; Azemi et. al., 2011; Pohl et. al. 2011). MIT, Stanford, and Harvard put some of their lectures online for the public to view. However, educational psychologists are beginning to recognize that this is simply yesterday's classrooms transported to today's technology. Although it does lower the cost of instruction, it does not answer more fundamental questions of how people can build knowledge collectively and innovate.

Making education relevant in poor countries must include such collective and innovative skills as most pressing issues that impact these countries may well be complex in nature. These (political, economic, environmental, social and cultural) issues require solutions that consider local contexts. Such issues link local communities with global forces and are best solved using networked methods of collaboration, whether the networks be local community networks, networks of linked universities, or collective-adaptive methods of building and linking content as a resource for the students, who are learning complex problem solving skills.

3.3. Innovation through Collective Intelligence

Such complex problem solving requires more than delivery of expertise through electronically efficient technology. It requires, rather, that people build knowledge collectively. Sawyer (2006, p.6) says, "The most pressing problems that face our world

are large in scale and complex in nature, far out of the realm of any one person to resolve – poverty, pollution, hunger, disease, armed conflict." The challenge, now, is not so much how to access the basic information, basic skills, or basic facts. Most of that is either on the Web already or rapidly being digitized and going into digital form and personal digital devices. The challenge is to combine basic information such that it provides a solution to a complex problem.

As many examples on innovation have shown, high quality and high quantity of innovation emerges in an environment, in which agents can exchange resources beyond the boundaries of formal organizations (Chesbrough, 2003; Castilla et al., 2000). For example, in Silicon Valley, innovation is high, since knowledge flows freely between R&D centers and start-up companies due to high mobility of human resources (Castilla et al., 2000). Chesbrough (2003) analyzed this in detail in 2003 and defined innovation that is based on knowledge sharing as Open Innovation. It differs from the old way of innovation, which achieves innovation through vertical integration of research, development, and marketing. Equivalently, the Web lowers the boundary of geographical separation. It allows people from different parts of the world to collaborate on problem solving and to innovate, using their collective intelligence.

Collective intelligence has become an attractive subject of interest for analyzing users' motivation to participate in a value creation process. Although the enabling role of Web and the growing amount of shared data needs still to be examined with respect to knowledge creation, creativity, and innovation processes, successful examples of collective intelligence have already emerged. Building knowledge collectively is a useful and cost-effective way of tackling complex problems.

4. Applied to a Development Situation

In December 2010, a group of students and professors at Seoul National University began work on a new concept for higher education for poor countries. From the beginning, the challenge has been to build a different type of higher education system. By building on existing theories but using a different perspective on those theories, new applications in the field of higher education could be designed. Table 1 shows how the theories are viewed and how this views result in applications in higher education.

Table 1 How existing theories and concepts were viewed and transformed into applications of the Global Knowledge Alliance

	Old Views	New Views	Global Knowledge Alliance Applications
Development Theory Challenges	One path to development: follow path of mature economies	Development derives from ability of societies to build new ideas	An untapped resource are local communities and universities students. Old model did not tap this resource – assumed all valuable knowledge derived from industrial economies.
	Educational benefits derived from industrial output	Educational benefits derive from networks of people working together – sometimes through industry but often in other sectors of a society	Build networks: whether linking local university to global networks or linking local university to local networks of NGOs or local communities or building networks of local communities
	Formal education is a huge physical and institutional infrastructure of a society designed to increase industrial input through long-term investments	Much knowledge is available on the internet but requires expertise to sort, organize and update it	Build a collective-adaptive system to organize knowledge for all venues Use this system to reduce costs to poor countries
	Foreign aid is investment that brought poor countries into global economy through wealth transfer and investment	Link between poor and wealthy countries is co-dependent network of sustainable and stability systems	Build systems that helps stabilize co-dependencies Build systems that use each other's strengths Build systems that use best knowledge of entire system
Economic/Human Capital Theory Challenges	Societies grow through industrial production	Societies grow through fostering of new ideas	Build pedagogical system linked to local contexts that reward students for solving problems
	Major challenges are continued growth, high tech, building expertise, and global competitiveness	Major challenges are solving of complex global problems which are globally linked and locally manifested such as disease, environment, political and social stability, migration and equity	Give students substantial tools to in global networked systems including globally linked curriculum, ability to create and link their own modules and IT skills. Also, ask them to solve local problems that are globally linked. Build pedagogy that requires them to work collectively to solve complex problems.
	Education contributes to society welfare through increased industrial productivity and individual income	Education contributes to society welfare through raising ability to link to others, create new ideas and build new ideas collaboratively. Knowledge creates a new resource for societies which is	
Learning Theory/Pedagogy Challenges	Biggest learning challenges are about how to make masteyr of material more efficient and easier	Mastery of material is becoming easier through technology. New challenge is how to build methods to build and organize collective intelligence and manage new knowledge as it changes –	Build curriculum system that is both collective and adaptive. Use existing web and web resources when mastery of set material is required. But, when dynamic knowledge is required, build system that rewards global and local participants to organize web content into new modules for students. Contents can easily be changed and adapted. Curriculum is used in hybrid classroom situation. Learning is guided
	Role of technology is to make delivery of learning materials more efficient so mastery is faster and more cost effective	New challenge is to use technology to build new methods to facilitate human capacity to solve complex problems	
	Knowledge flow is largely about getting the best knowledge accumulated at the top and then distributed	Knowledge flow is largely about building networks such that knowledge can flow across all knowledge sources and be shared. All sources have some information which might be helpful in solving complex problems.	Build curriculum system that allows users to respond to curriculum, propose changes and uplink their own modules. Make final projects the link curriculum with local community situation that tackled complex global-local problems.

4.1. Zambian Start-Up

The Global Knowledge Alliance was incorporated in Zambia in 2012 and will open a pilot school in July 2012. It will consist of a classroom located at the University of Zambia, and will have links into villages nearby, where students will conduct fieldwork. The development plans of the village communities will be linked both to student projects and to a global community network. Curriculum modules have currently been developed at Seoul National University. Later, locally relevant curricula will be formed for the school through a global network.

4.2. Global Network for Course Curriculum Development

The Global Knowledge Alliance uses a collective adaptive system for building course syllabi, using existing Internet content (e.g., articles, blogs, videos, Web pages), which are organized into modules by a variety of people and institutions, who have incentives to see their ideas and content valued and selected. Therefore, a module represents the specific view of the module author (e.g., multi-lateral agency, bilateral donor, NGO, professor, graduate student, country, social movement, broadcaster, and content provider). A diverse set of module authorships means that a variety of authors compete to get their views and content into modules and into syllabi. This keeps the content up-to-date, provides competing views on topics for viewers, and allows combining local issues and perspectives (i.e., knowledge) with global knowledge. Professors of the Global Knowledge Alliance select this organized content for their courses or studies. It will reduce their cost of syllabi creation.

5. Conclusion

Traditional higher education systems modeled after those of the wealthier countries has failed in poor countries, since their approach is not relevant to the local situation and is not providing most people access to expensive higher education systems. Traditional higher education systems made two false assumptions. First, the knowledge contained in the wealthier societies had value to both the wealthier societies and to the rest of the world (i.e., to solve today's complex, globally-linked problems). Second, global knowledge needs simply to be disseminated using the existing information and communication technology in poor countries.

What the multi-nation, multi-disciplinary teams that tried to establish higher education systems did not anticipate was that it would have to draw from a variety of fields, emerging theories, and applications. It would not only have to apply the latest technologies, theories and applications in knowledge economics but also to rethink how knowledge is constructed and learned in the context of these countries. It would have to structure a learning institution that could capture the value of untapped knowledge, find ways of capturing collective adaptive knowledge to build a dynamic curriculum system, and design networks that link rural communities, local universities, and major world higher education institutions.

This integration of innovative learning, global networks, and knowledge economics, however, is required to design a higher education system that serves the local population in poor countries at an affordable rate, makes higher education dynamic and relevant to local needs, and addresses global issues that impact local communities on a daily basis.

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